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The Watershed Look ...at Soil and Conservation : Extension Circular 5-35-65

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E.C. 5-35-65

The Watershed Look...

at Soil and Water Conservation

A 4-H Club Member Project in Understanding the Watershed Community Approach to Soil and Water Conservation.

EXTENSION SERVICE
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE AND HOME ECONOMICS
AND U. S. DEPARTMENT OF AGRICULTURE COOPERATING
E. F. FROLIK, DEAN E. W. JANIKE, DIRECTOR

A Watershed Look at Soil and Water Conservation

By
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ACKNOWLEDGMENTS

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INTRODUCTION

Why This Project Is Important to the 4-H Member

Soil and water conservation is wise use and care of the two most important natural resources--soil and water--for the greatest good, for the most people, for the longest time.

How wisely our soil and water conservation problems are solved will be reflected in the wealth and spirit of tomorrow's people. A working knowledge of the watershed approach to land protection and flood reduction is important for planning community-size programs. Those who practice soil and water conservation on the land have taken the first step toward solving their water problems. But complete control of water and soil requires action by the people in each watershed. We all have a share in the watershed job to be done.

As you begin this project remember that conservation is a part of good citizenship. Conservation implies the greatest good for the greatest number not only now, but for future generations. It involves attitudes as well as understandings and techniques. All of the knowledge you can gain as a 4-H club member will help continue the vital conservation program.

MEETING NO. 1.
FACTS ABOUT WATER

New Words to Look For

Precipitation: Moisture that falls from the atmosphere as rain, snow, sleet, or hail.

Evaporation: The process of changing water into vapor.

Vapor: Water in the air that cannot always be seen, such as when steam disappears.

Surface Water: Water on the land surface that we can see.

Ground Water: Water stored in sand and gravel formations under the land surface.

Artesian Well: Ground water that flows out like a fountain, caused by internal pressures.

Erosion: The washing or wearing away of land by the forces of water, wind, and ice.

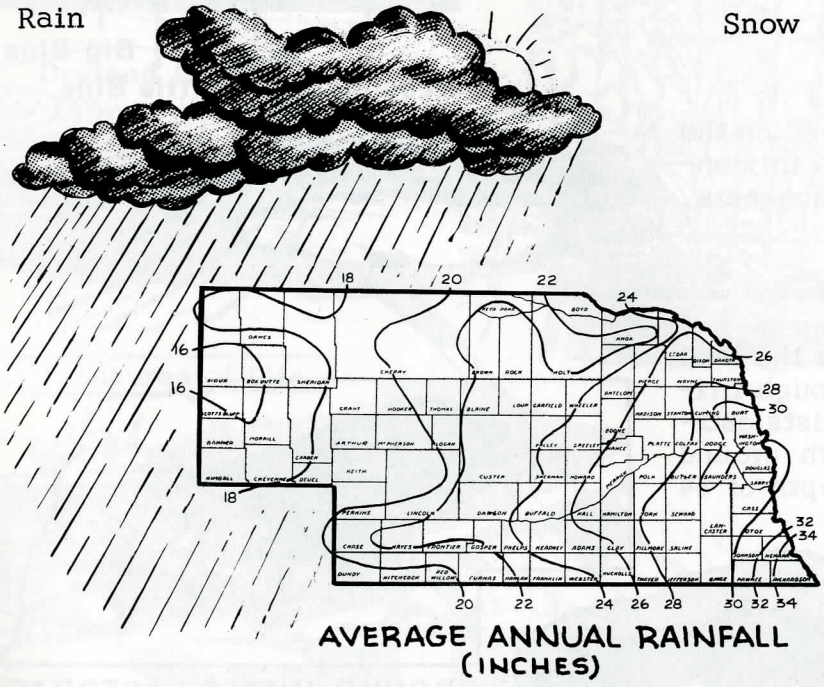
Water Cycle: A chart showing the paths that water can take as it appears in the atmosphere, on the land surface and under ground.

Water is life. Next to air, water is our most important resource for survival. You can live longer without food than you can without water.

Animals and plants that provide man with food must also have water. Without it, there is no life. Too much water at one time can be destructive. This means that the proper balance of water is very important to our lives.

Water can exist as a liquid, as a vapor, or as a solid. Water comes to us in these forms:

Rain



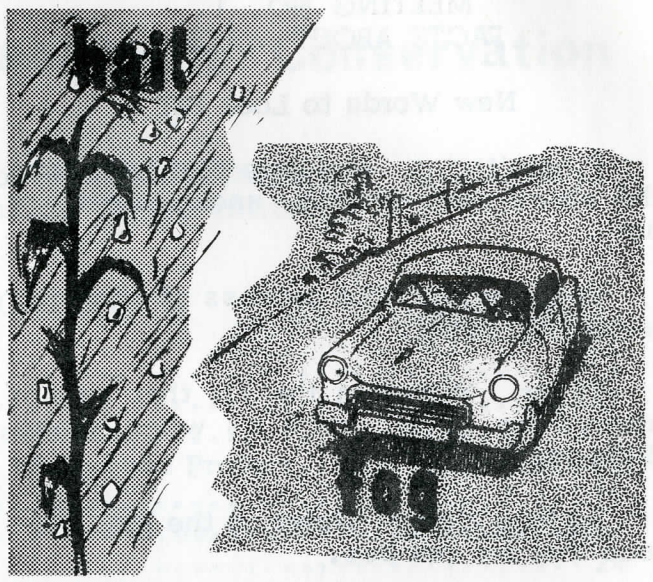
AVERAGE ANNUAL RAINFALL
(INCHES)

Snow

Snow and rain are the greatest contributors to our water supply in Nebraska. The average yearly precipitation in the eastern third of Nebraska is 28 inches; in the central third of the state, 22 inches; and in the western third, 18 inches.

Sleet or Hail

Sleet and hail form from raindrops falling through air that is below the freezing point.



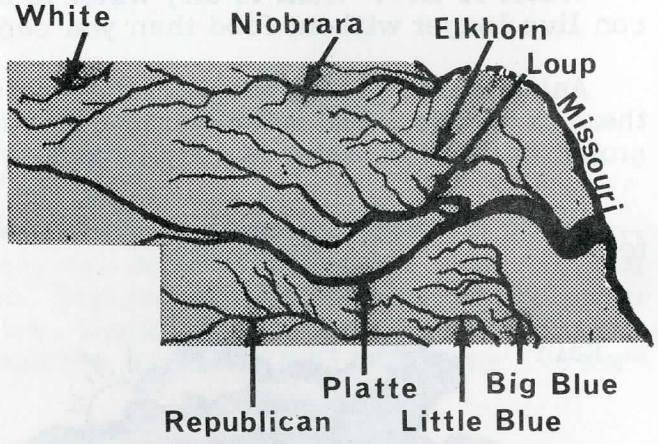
Dew and Fog

Fog differs from a cloud only in that it is near the ground. Fine rain drizzle often occurs in fog.

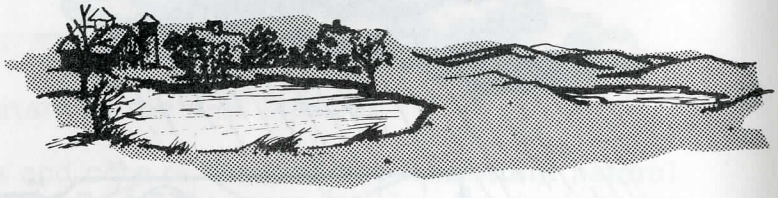
When the ground begins to cool moisture condenses from the air to form dew drops on plants. Water from this source is evaporated. It does reduce the rate at which plants use water from the soil.

In Nebraska water reaches us by:

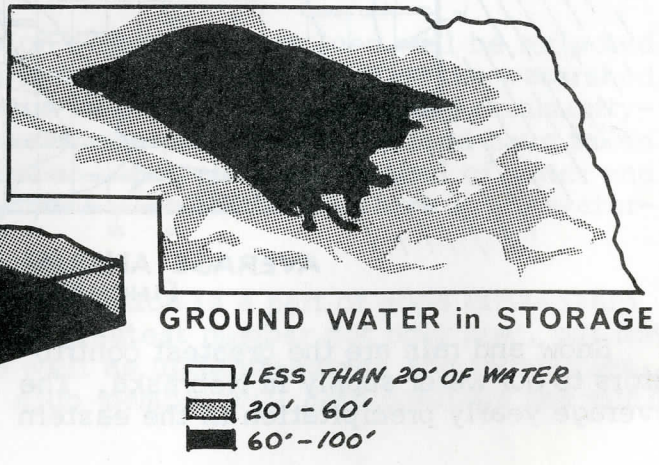
1. Surface flow (water flowing across the land surface). Nebraska has nine major rivers that carry surface water from west-to-east across the state. In addition, there are 300 to 400 smaller rivers and streams that carry water to these major rivers. These are called tributaries and contain the areas where small watershed projects are being organized.



2. Surface storage (water stored on the land). You find surface storage in man-made reservoirs, farm ponds and dug-outs, and natural lakes.

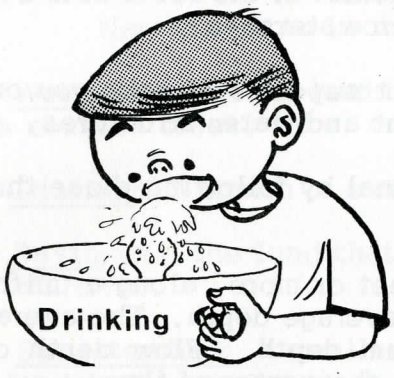


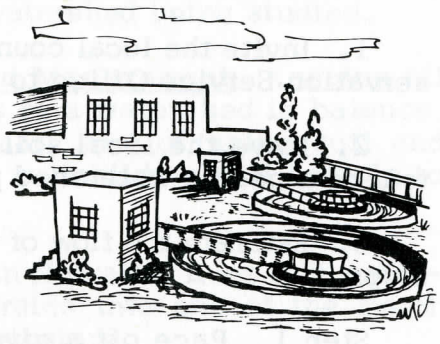
3. Ground water (stored under the land surface). We use this water through irrigation wells and springs. Geologists estimate that Nebraska has enough ground water to cover the state to a depth of 34 feet.



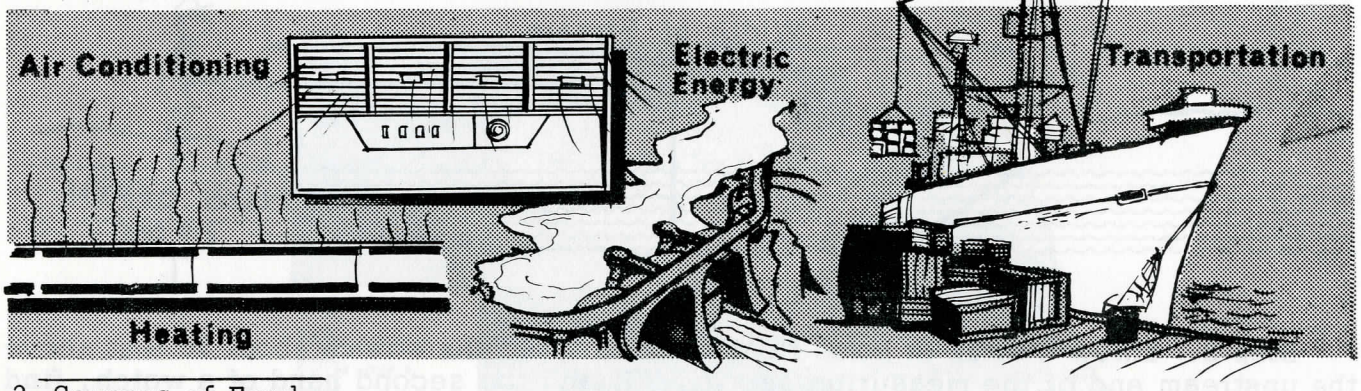
We use water in Nebraska for:

1. Substance of Life

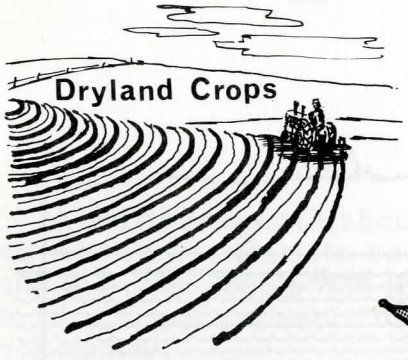


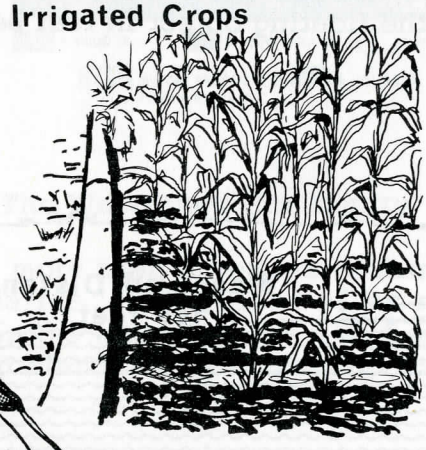


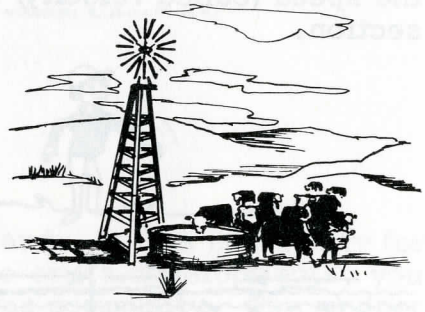
2. Comforts of Life



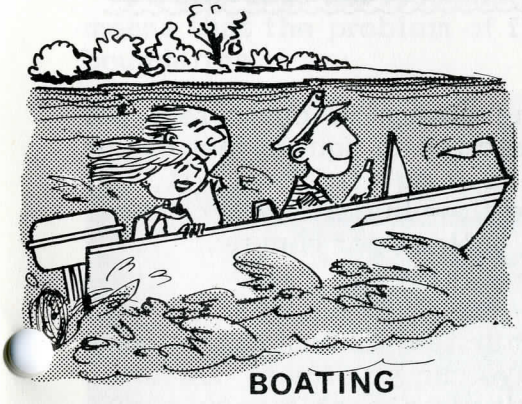
3. Sources of Food

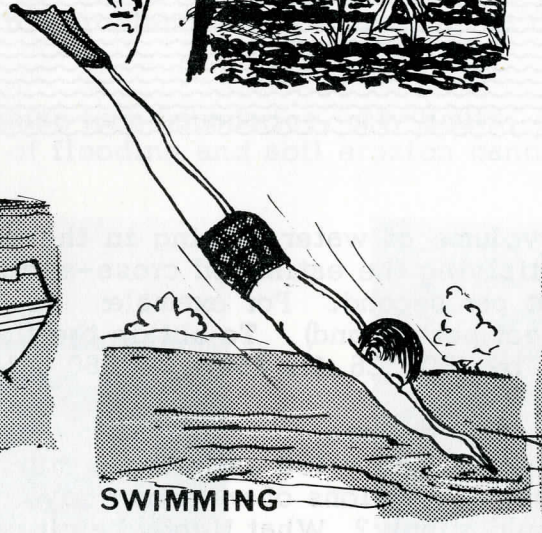


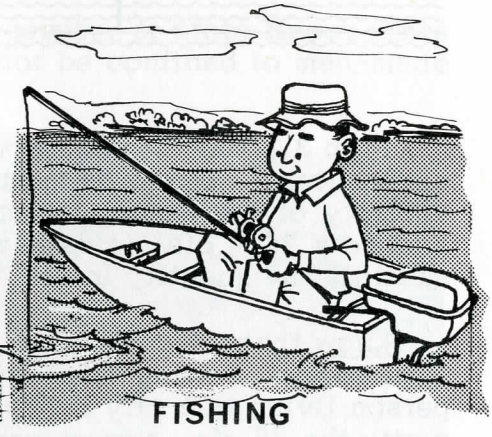




4. Pleasures of Life







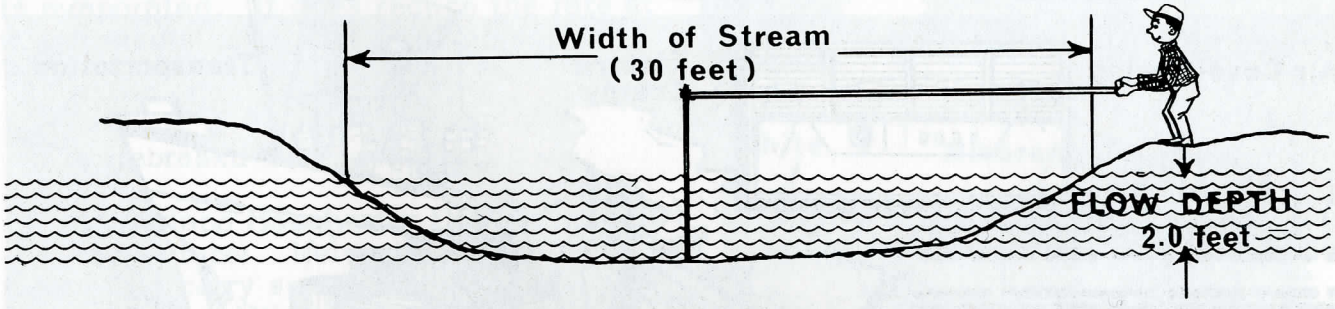
Activities for You

1. Invite the local county agent or work unit conservationist of the local Soil Conservation Service Office to show colored slides or a film on watersheds.

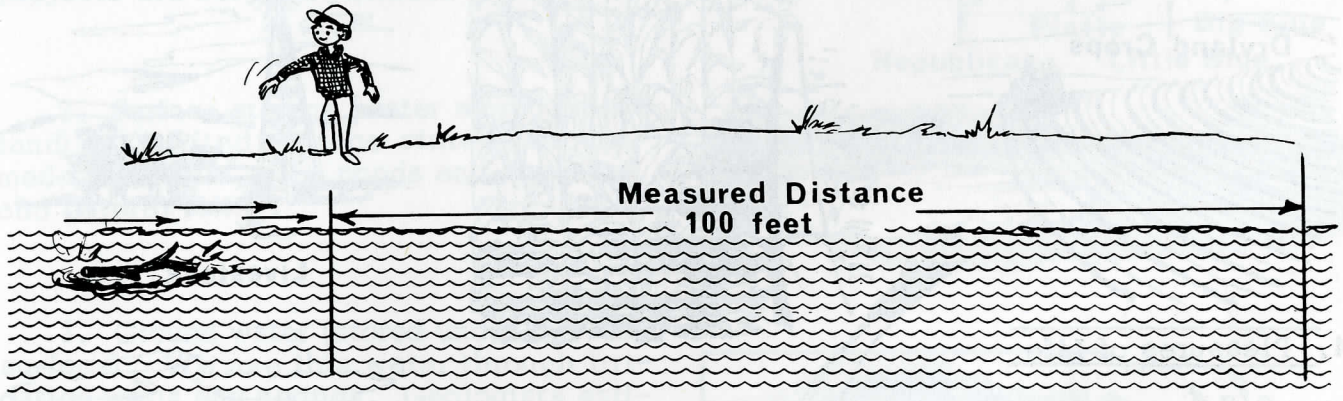
2. Have the local soil and water conservation district supervisors take you on a tour of a nearby watershed project to see the land treatment and water structures.

3. Estimate the flow of water in a stream or irrigated canal by following these three steps:

Step 1. Pace off a given distance, preferably 100 feet or more, along a uniform section of stream. Estimate the surface width of water and average depth. The average depth can be estimated by taking 0.6 times the maximum depth. Flow depth can be measured by extending a measuring rod from a pole into the center of flow.



Step 2. Throw a stick or some floating object into the stream about 30 feet above the upstream end of the measuring section. Using the second hand of a watch, find the speed (called velocity) of the floating object in feet per second along the measuring section.



Step 3. The amount or volume of water flowing in the stream in cubic feet per second can be found by multiplying the estimated cross-section in square feet by the velocity of the water in feet per second. For example: 12.0 sq. ft. x 2.2 ft. per second = 26.4 cfs. (cubic feet per second). To obtain the flow in gallons per minute multiply the quantity in cfs. by 450: 26.4 x 450 = 11,880 gallons per minute.

Know that: 1 cubic foot = 7.5 gallons
1 cubic foot flowing 1 foot per second = 450 gallons per minute. Assuming that each person living in a city requires 100 gallons of water per day, can you figure how large a city the 26 cfs. stream would supply? What Nebraska city is near this population?

MEETING NO. 2.
WHAT IS A WATERSHED

New Words to Look For

Watershed: All the land that drains into a common creek, lake, or river.

Tributary: A branch of a stream or river.

Basin: All the land that drains into a certain river.

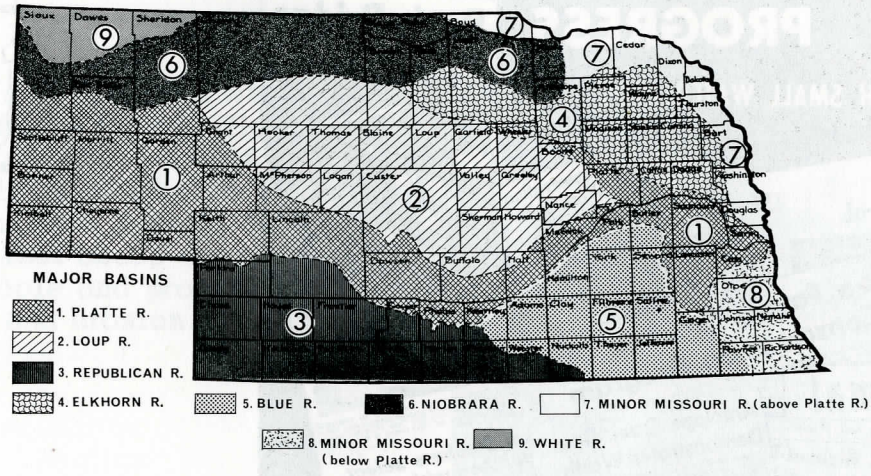
Subwatershed: A smaller tributary that drains into the common creek, lake or river.

Watershed Community: Everyone that lives in the watershed being studied.

Watershed Management: Keeping all the resources of a watershed in balance, with the primary aim of using soil and water so that our children will be able to enjoy them.

Everyone in Nebraska lives in a watershed which drains into one of the major rivers or its tributary.

In which major river basin (or watershed) do you live?



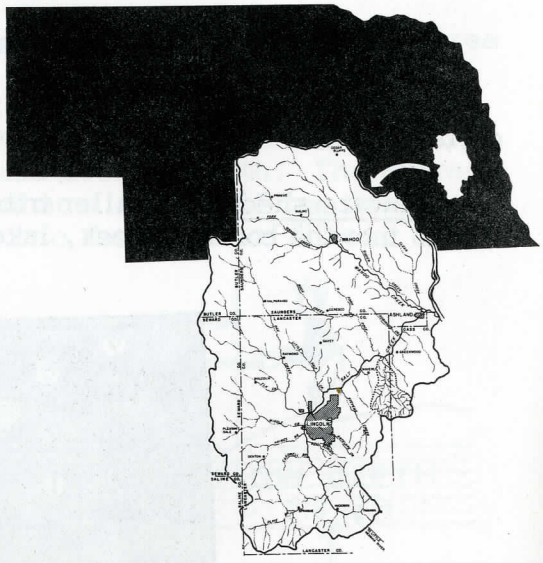
The Watershed Community

A particular watershed is more than acreages of farm land. It is a community for all who live within its boundaries. Regardless of its size or its developments, you and the other people who live in the watershed are a part of this community. The manner in which your conservation problems are solved is up to the people in your watershed community.

Water does not recognize farm boundaries, city limits, county, or state lines. This means that the problem of flooding and soil erosion cannot be confined to man-made boundaries.

A watershed project is most often the best way to prevent flooding and control of erosion. In Nebraska more and more people are understanding the necessity of working together as a watershed organization to solve flood and land erosion problems.

So much interest and enthusiasm has been generated already in this new approach that the phrase "a watershed project" has become familiar.



Activities for You

1. a. Obtain a map of your county and outline the boundaries of the watershed in which you live.

   b. Find how many sections of land are within the boundaries of your watershed. A section of land is one square mile and contains 640 acres.

   c. Find how many acres are within your watershed.

   d. How many towns are in your watershed? _____

   How many farms? _____

   How many people live within its boundaries? _____

2. Are there any organized watersheds in your county? _____ If so, obtain a map of the watershed from the Soil Conservation Service office. Make a report of the plans and progress for this watershed. Give the report to your club.

3. Take the nine letters from the word W-A-T-E-R-S-H-E-D and by matching them with Soil and Water Conservation words that you know, make a display poster.

MEETING NO. 3. PROBLEMS IN SOME OF OUR WATERSHEDS

New Words to Look For

Runoff: That part of a rainstorm or snow melt which does not have time to enter the soil.

Flood Damages: The cost in dollars and cents from a certain flood in a watershed.

Sheet Erosion: The removal of thin layers of soil on sloping land. It occurs very gradually and often goes unnoticed.

Gully Erosion: A large, deep ditch that has been formed by uncontrolled water flowing in a narrow channel.

Slope: The number of feet that land falls (or rises) in 100 feet of horizontal distance. This figure is expressed in percent.

Sediment: Soil washed from land slopes and deposited in streams or flood plains.

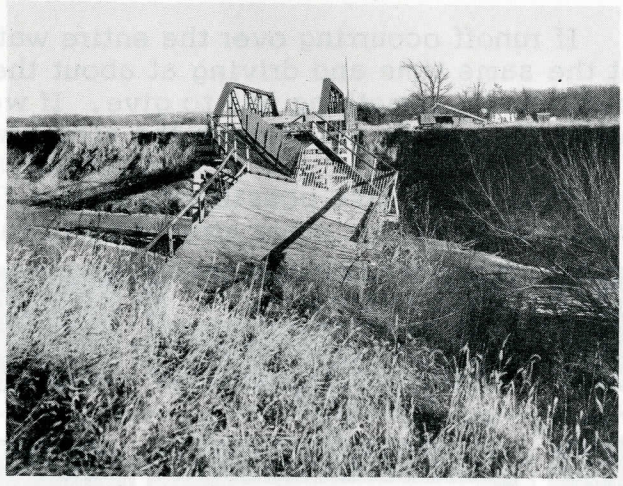
Pollution: When soil or sewage are allowed to get into our water, making it unfit for wild life and human uses.

Water that falls as rain on a watershed is often thought of as a friend. However, when it falls so fast that most of it cannot enter the soil, it can be an enemy. When this happens two general types of problems develop that cause considerable destruction to people and property in the watershed: flood and erosion.

Flood Problems

1. Cities and towns are flooded by streams overflowing their banks.

2. Farm buildings and fences are damaged by floods.



3. Bridges, roads, and highways are damaged by floods.

4. Lives are lost in flood waters.

Erosion Problems

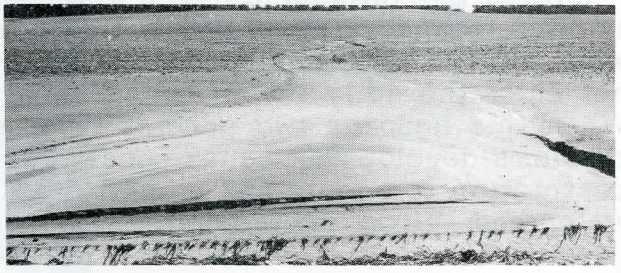
When heavy rains are allowed to move off the land uncontrolled, these erosion problems occur:

1. Sheet erosion, when thin layers of soil move off the slopes.

2. Large gullies form and much of the land becomes worthless.

3. Crops are damaged by silt and ponded water.

4. Sediment fills basements, stock-ponds, and fishing holes.



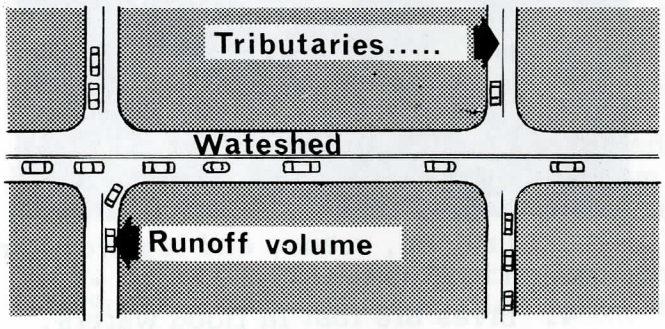
5. Topsoil has been lost forever. More seed, fertilizer, insect and weed control are required.

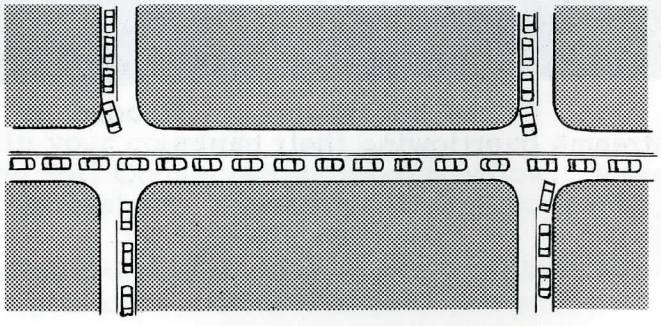
Why Do Floods Develop?

Floodwaters rise and cause damage in about the same manner that traffic jams occur and accidents happen on busy city streets. The cross streets represent the tributaries of a watershed and the cars on the streets represent the runoff volume in each stream.

If runoff occurring over the entire watershed is represented by the cars starting out at the same time and driving at about the same speed, our main street will swell with traffic until something has to give. If we can stop or slow some of the cars, this will allow the rest to get through the street without causing a traffic jam.

Thus, it is also possible to reduce flooding by good land treatment and proper location of dams and other structures in the watershed.





How To Evaluate Damage from Floods

To compare flood damages from different storms, dollar values must be placed on all damages. When a watershed project begins someone will be concerned about the high cost of flood damages for the community. Then steps must be taken to estimate the yearly flood damage within the watershed.

A damage map of the watershed floodplain will need to be made for each watershed and a table of flood damage values prepared.

Table of Probable Flood Damage Value

Crops	Assumed Yield, Bu.	Spring	Summer	Fall
Corn	65*	$18.00	$18.00	$ 4.50
Sorghum	70	13.00	22.00	30.50
Wheat	30	9.50	8.00	1.50

*Assuming 1-2 foot of flooding

Livestock

Stock cow	$150-200
Riding horse	$200-400
Hogs (100-150 lb)	$ 20- 40

Fencing

Barbed wire (per foot)	7.5¢
Woven wire (per foot)	10.0¢

County Roads (replace gravel and repair fill) 10¢ per foot

Bridges

Replacement

25 ft. span	$3,200 (wooden construction)
50 ft. span	$8,000

Farm Buildings

$300-$500 average

Life

???

Activities for You

1. List the items that would be damaged if your family home were to have flood water one-foot deep on the ground floor. (Don't forget the basement.)

2. If your farmstead were flooded and had the following losses:

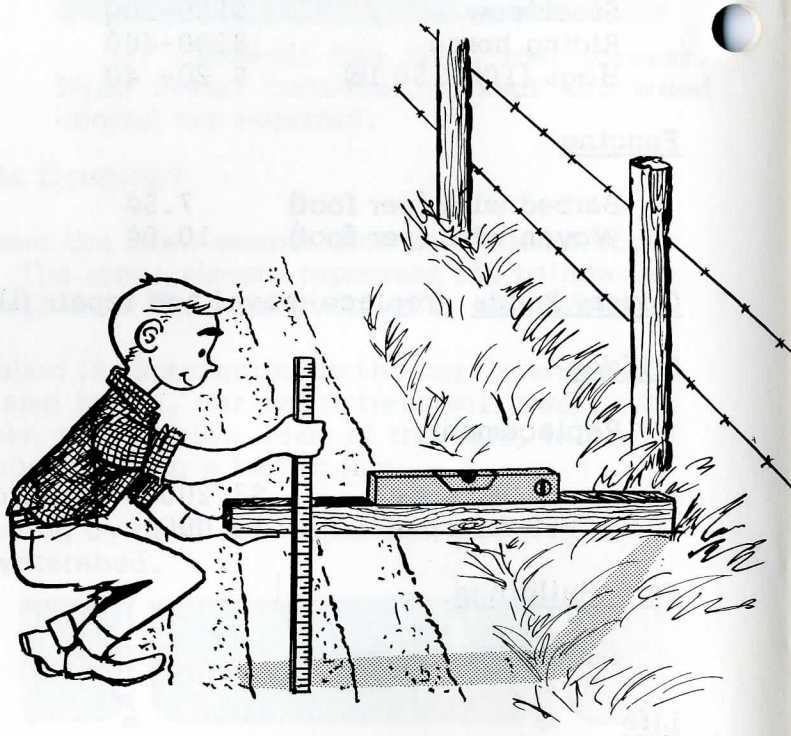
   a. 30 rods of fence washed out_____
   b. 50 acres of corn destroyed_____
   c. 10 hogs drowned_____
   d. Farm building moved off foundation_____
   Total damages_____

3. Ask your parents to drive you through your watershed. Make a list of where you see these watershed problems.

Large gullies_____
Sheet erosion_____
Road ditch filled with silt_____
Roads closed by flooding_____
Trash on fences_____

4. Measure the slope of a waterway or gully. Slope is expressed in percent, meaning the number of feet the land falls (or rises) in 100 feet of horizontal distance. You can measure how steep a slope is with some simple materials.

You will need a yardstick, a straight stick exactly 50 inches long, and a carpenter's level or a flat bottle half full of a colored liquid. Go out on the farmyard or to any place you would like to know how steep the slope is. Place the 50-inch stick horizontally on the ground (one end will be higher than the other because of the slope). Put the level (or the bottle) on the 50-inch stick, and move one end of the stick up or down until the bubble (or the water) shows the stick is level.



Read on the yardstick the distance from the ground to the bottom edge of the horizontal stick. This reading in inches, multiplied by 2, gives the percent of slope.

If you use a stick 100 inches long the reading on the yardstick would give the percent of slope and you will not need to multiply by 2.

MEETING NO. 4. COMMUNITY BENEFITS FROM A WATERSHED PROJECT

Words for You to Know

Direct Benefits: That portion of the cash value placed on flood and erosion losses that will be prevented or reduced.

Indirect Benefits: Such things as safety of life, beauty of a community, stronger community effort and improving a place to live, are all things on which we cannot put a cash value.

Private Property: Land, buildings and businesses owned by individuals.

Public Utilities: Railroads, highways, telephone lines and bridges are all examples of utilities serving a watershed community.

Multiple-use Structure: A flood control dam that is designed to include other uses such as: recreation, irrigation and water supply.

A watershed project is a story of local people working together to solve common flood and erosion problems. As you already know, these problems often cause damage that runs into thousands of dollars each year. Such losses often work a financial hardship on city and farm businesses. Plans need to be made to prevent future disasters. The best organized plans can be prepared by setting up a local watershed organization.

When a watershed organization is formed the local people, with the assistance of county, state, and federal governments, will develop the type of program that will give them the most benefit from flooding and erosion control for the least cost. This means that the total direct or monetary benefits from the project must be compared with the total cost of construction. When this is done a project benefit-cost ratio is determined.

For a watershed project to be approved in Nebraska there must be about $1.20 of direct benefit for each $1.00 of cost. For example: if a certain dam or any structure were to cost $40,000, you must be able to show $48,000 or more of real benefits from the structure being installed. If this benefit-cost ratio does not exist the structure being planned will not be built and a substitute plan should be considered.

There are many types of structures and practices that a community can use to obtain benefits in a watershed. You will learn about these in a club meeting to come.

Some of these benefits are measured by the money they save and are called direct benefits. Examples of direct benefits are those that prevent the losses from floods and erosion discussed in the last meeting.

Indirect benefits cannot be measured in dollars and cents and include freedom from worry about loss of crops, business, and life itself.

With the community approach it is correct to say that "everyone benefits from a watershed project." Benefits are obtained for:

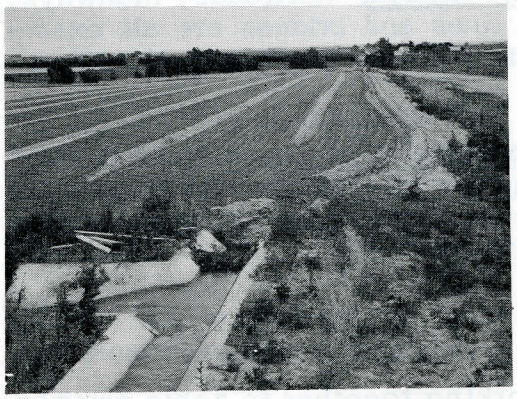
The farmer: by reducing damage to fences, livestock, soil, crops.

The city dweller: by reducing damage to stores, homes and streets.

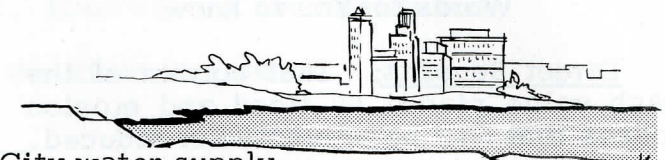
The county and state governments: by reducing damage to roads, bridges, gravel.

The community: by a more prosperous agriculture, more prosperous towns, and less danger for the citizens.

Multiple-use reservoirs can provide added benefits. Most watershed projects will include one or more flood control reservoirs. Many times these man-made lakes can be made large enough so that they not only hold back flood water, but retain enough water for several other uses, such as:



Irrigation



City water supply

Recreation and wildlife

Activities for You

1. You may assume that one inch of topsoil can be lost during a 5-year period on each acre on an unprotected watershed. Knowing that one acre inch of topsoil weighs about 150 tons, and that the average size of small watersheds in Nebraska is 60,000 acres, find how much soil could be lost from such a watershed in five years.
_____tons.

If the soil is valued at $1.00 per ton, what would this soil loss cost the watershed in five years? _____

2. In an average Nebraska silt loam soil one inch of topsoil from one acre contains these amounts of available fertilizers:

15 lb Nitrogen, valued at 12¢ per pound

15 lb Phosphate, valued at 10¢ per pound

150 lb Potash, valued at 7¢ per pound

Using the above average value as the cost of buying these fertilizer elements, what is the cash value of the fertilizer loss contained in one-inch of topsoil per acre? Also, figure the loss of just these three necessary fertilizers from a 60,000 acre watershed.

Recommended fertilizers just applied can be washed out by erosion and this loss could be added! Realize then that this is only a part of the value of soil lost. Other losses not considered here are:

Effect on cultivation

Silting and crop damages

Effect in reducing yields.

MEETING NO. 5. ORGANIZING A WATERSHED

Words to Look For

Agencies: Federal, state and local organizations established to carry out certain delegated responsibilities. Such agencies as the Soil Conservation Service (Federal), Nebraska Soil and Water Conservation Commission (State), Extension Service (State and County), Soil and Water Conservation District (local), are helpful in the education, planning, and application of a watershed organization.

Watershed Application: Request for a preliminary plan for using soil and water resources in a watershed.

Work Plan: A written plan explaining and outlining the work to be done and the responsibilities of all agencies and groups in the watershed.

Right of Way: The permission to build and maintain structures on property of another person.

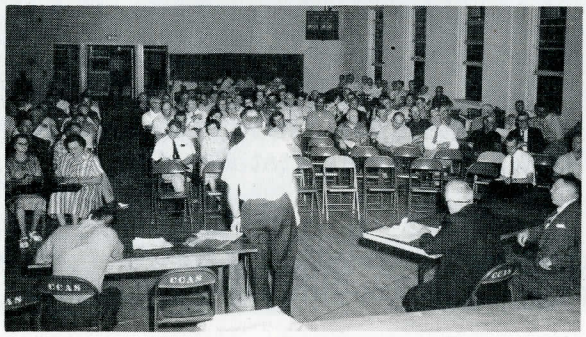
Sponsoring Organization: An organization under state law that has authority to construct, operate, and maintain watershed improvements.

How the Organization Begins

A watershed is organized by the people living within the boundaries of the watershed. It may be just two or three people who first start discussing the problem. Then they discuss the idea of a watershed with other friends and neighbors. A meeting is called.

If enough people are interested in investigating the possibilities of this kind of project, larger meetings are called. During this period agency people can be called on to further explain detailed watershed organization plans.

Only those people living within the watershed area decide whether they should organize or not. If a town is within the boundaries of a watershed, the people living in the town must know about the possibility, purposes, and other details of watershed organization. They may have just as much interest as the farmer or rancher.



When all people living within the boundaries of a watershed have been informed about the possibilities of a watershed plan and they are favorable toward the idea, then:

1. Flood damage reports must be obtained by the local people for a particular storm.

2. The facts obtained in the flood damage survey are included in a written application. This application requests the services of state and federal watershed planning specialists.

3. The application is sent to the Nebraska Soil and Water Commission at the State Capitol, Lincoln, Nebraska. This group is responsible for approving or disapproving the application.

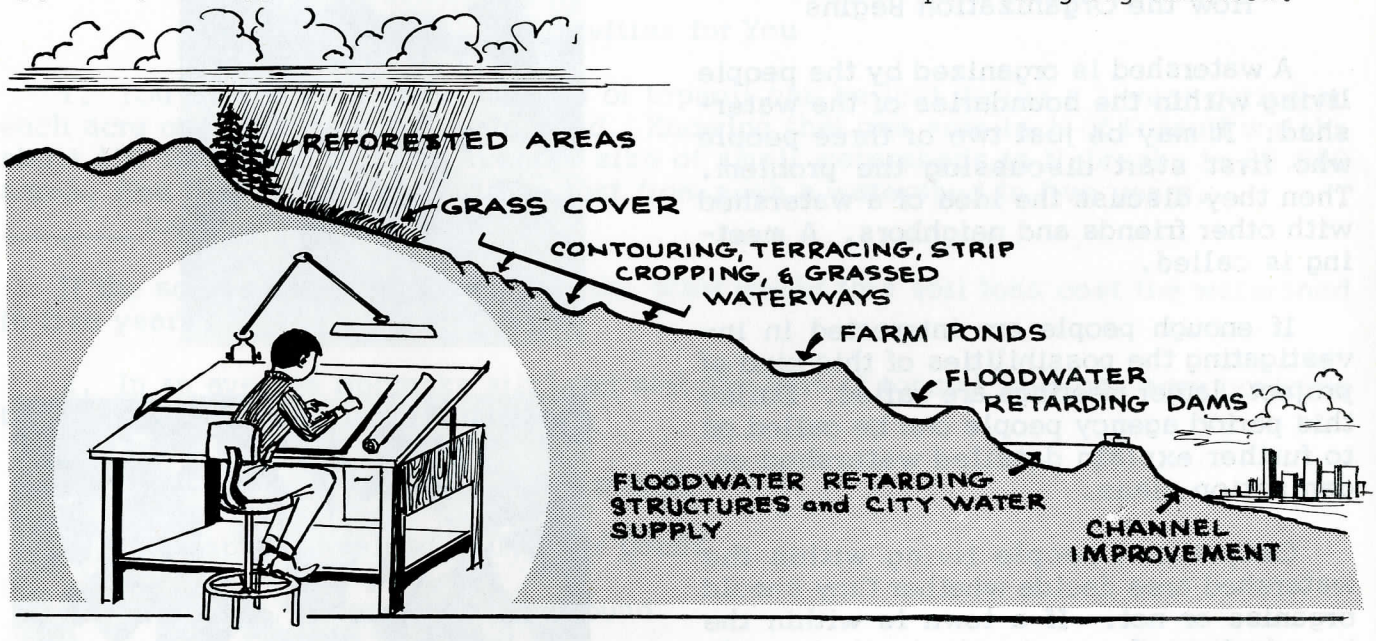
4. Priority for planning is then made by the Nebraska Soil & Water Commission.

5. The Soil Conservation Service makes a survey of the watershed and develops a work plan for the watershed.

6. The work plan can be approved or disapproved by the local watershed organization. If disapproved, it can be reviewed and changed.

7. Upon approval by local people the work plan is sent to the administrator of the Soil Conservation Service. It is reviewed and approved or disapproved by the appropriate committees of Congress.

8. If approved in Washington the State Conservationist of the Soil Conservation Service prepares the plan for the signature of the local sponsoring organization.



How do Local People Pay Their Share of the Costs?

There are two methods by which local people pay their share of the costs of watershed construction.

1. Organization of a Watershed Conservancy District. This is organized under a Nebraska state law and has power to levy taxes against the property in the watershed. The tax money is used to buy easements, rights of way, or land and pays for many other official duties as stated by state law.

2. Local farmers apply land treatment practices on their individual farms and ranches. These include terracing, grassed waterways, seeding of eroded land to grass, proper pasture and range management, and other conservation practices.

Activities for You

1. Have your club prepare a county fair or store window exhibit. Show a watershed with land conservation treatment and flood control structures. Next to it show a watershed with no land conservation treatment. This would show gullies, bridges washed out, etc.

2. Watch your local newspapers for news about watershed projects. Cut them out and mount them in a scrap book. This will help you learn how watershed projects grow.

3. Have one of the leaders in soil and water conservation in your community take your club on a tour to observe some of the things that are happening in watersheds near your home. List all of the things you observed and compare your list with those of other club members at your next meeting.

MEETING NO. 6. LAND TREATMENT PRACTICES

New Words to Look For

Land Treatment: The recommended soil and water conservation practices used on the land by individual farmers or ranchers.

Crop Residues: Such crop material as corn stalks and wheat stubble that is left on the soil surface after grain harvest.

Flood Control Structures: Large dams built to hold back and slowly release flood waters.

Cost Sharing: Sharing the cost of the construction of a conservation practice between the Federal Government and the farmer or rancher.

Parts of a Watershed Program

The two main parts of a watershed program are:

1. Land treatment practices.

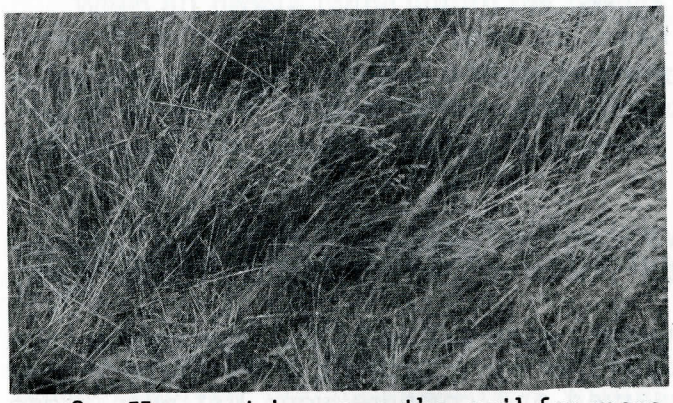
2. Flood control structures.

During this meeting we will discuss the land treatment practices of the watershed program.

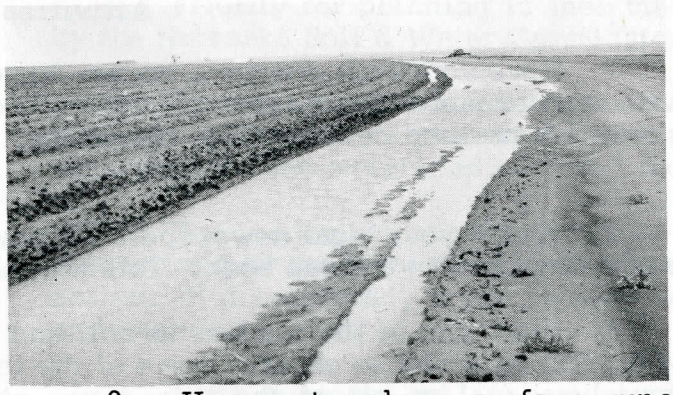
Who is Responsible for the Land Treatment Practices?

The farmer or rancher is responsible for the land treatment practices in any conservation program. He must consider three basic factors when preparing and farming his farm land.

1. He must protect the soil from the forces of rain drops.



2. He must improve the soil for more water absorption.



3. He must reduce surface runoff velocities to non-erosive speed.

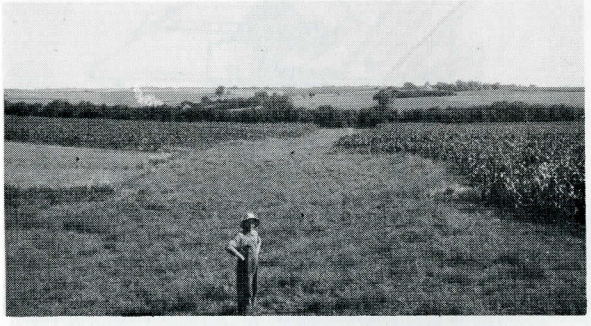
Surface runoff carries away precious topsoil into our ponds and reservoirs.

Streams of water flowing at high speed will carry away more soil as silt than those flowing slower.

Practices that control surface runoff are:

1. Terraces

2. Grassed Waterways



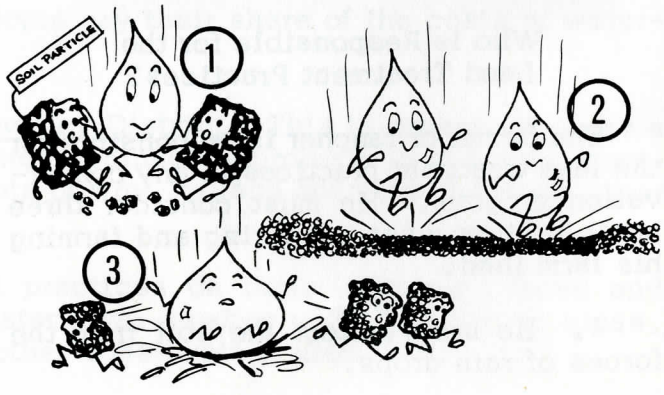
3. Contour Farming

When raindrops beat on bare soil these things happen:

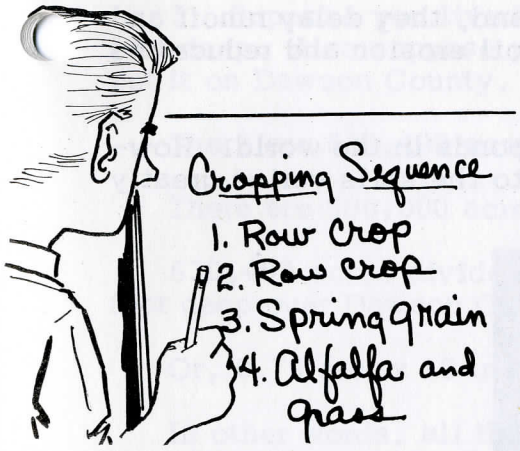
1. Soil particles are detached from each other.

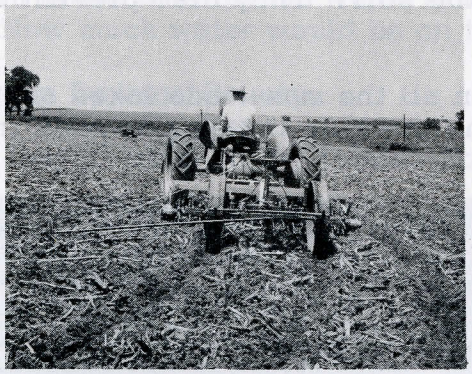
2. The beating action tends to compact the surface.

3. Their splash will generally start soil particles in motion.



Practices that reduce this from happening are:

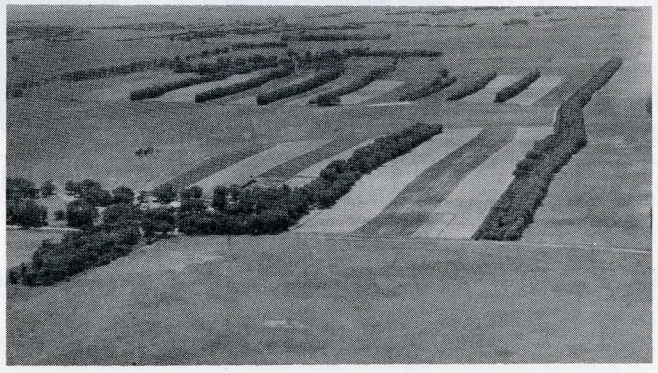




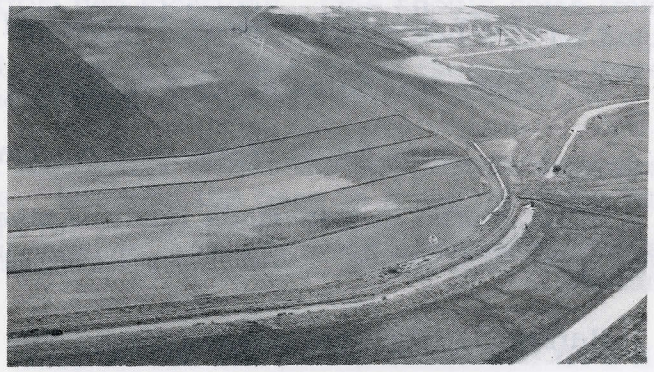
1. Proper Cropping Sequence 2. Residue Management 3. Pasture and Range Management

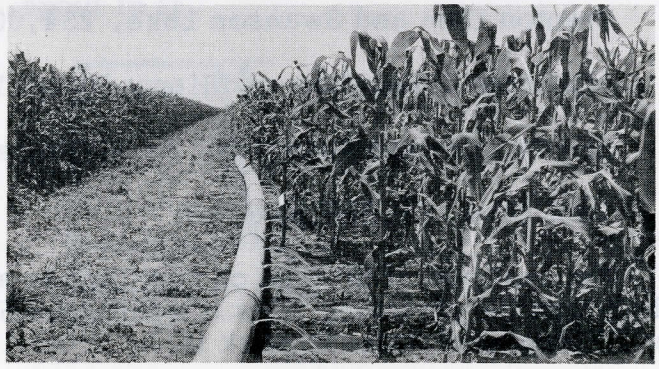
Other good conservation practices include:

1. Wind Strip Cropping
2. Field Shelterbelts
3. Bench Levelling
4. Conservation Irrigation
5. Farm Drainage



In putting these practices on the land, the farmer is helped in planning where and when to use them, in laying the practices out on the land, and in supervision of their construction. Conservation contractors are available for custom work in all counties of Nebraska. The Federal Government also helps the farmer and rancher in sharing construction costs.





What are the Purposes of these Practices?

When the practices are applied and maintained on the land, they delay runoff and allow more rainfall to enter the soil. They also prevent soil erosion and reduce the need for crop replanting.

Soil holds more water than all the man-made lakes and ponds in the world. However, the amount of water and the time it takes to soak into the soils varies greatly according to the kind of soil.

How Much Water Will Soil Hold for Use of Plants?

Our Nebraska soils vary as to how much water they will hold and can make available for our crops. However, for our 4-H project let's assume that:

1. A sandy soil holds about 1 inch of water per foot of soil.
2. A silty soil holds about 2 inches of water per foot of soil.
3. A clay soil holds about 3 inches of water per foot of soil.

How Much Water in Some Man-made Lakes in Nebraska?

Water stored in man-made lakes is measured in acre feet. One acre foot of water is enough water to cover one acre of land-one foot deep. Man-made lakes in Nebraska include:

Harlan County Dam and Reservoir, 500,000 acre feet

Trenton Dam and Swanson Lake, 254,000 acre feet

Medicine Creek Dam and Harry Strunk Lake, 90,000 acre feet

Enders Dam and Reservoir, 74,500 acre feet

John Lake, 50,000 acre feet

For example, if the soil on your farm is a silty soil and it is bone dry five feet deep, then from the preceding facts it would take 5 x 2 inches of water (capacity of a silt soil) or 10 inches of water to soak it.

Activities for You

1. Suppose you lived in Dawson County and had a silty soil and it was dry five feet deep. Also suppose you could take all the water from the Harlan County Dam and put it on Dawson County. How much water would be on the land?

There are 630,400 acres in Dawson County.

There are 500,000 acre feet of water in the Harlan County Dam.

630,400 acres divided into 500,000 acre feet = 0.79 feet of water, or water 3/4-foot deep over Dawson County.

Or, 0.79 feet x 12 inches per foot = 9.48 inches of water on Dawson County.

In other words, all the water in the Harlan County Dam would not soak up the soil five foot deep in Dawson County. Dawson County is only one county in Nebraska. Think of all the soil that would hold water in the rest of Nebraska, Kansas, South Dakota, Iowa, and all the other states.

Figure this same problem for your county, choosing a man-made lake nearest your home.

2. Prepare a list of farmers who have had different types of land treatment and structures applied on their land. Find out who did the construction work, the farmer or a conservation contractor. Find out from the County Extension Agent or Soil Conservation Service how much it cost to apply such practices as terracing, waterways, and bench leveling.

3. Demonstration activity. To find out how much moisture different soils will hold, follow these instructions.

Obtain equal amounts of soil by volume from two locations. One should come from an area where there is little organic matter. This soil may be in clods and will be hard to break up and dig. The other sample should come from a field where there have been clovers or grasses and there is an abundance of organic matter.

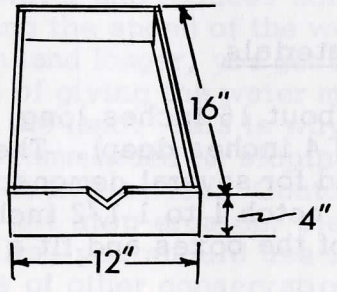
Dry both of the soils and break up any of the clods. Place the samples in separate cloth bags and weigh and record the weights. Suspend the bags in a pail of water for three or four minutes and allow them to drain for 10 minutes. Weigh each bag again, subtracting the original weights from the weights after draining. Which soil holds the most water? Can you tell why?

4. Demonstration activity. To show how mulches reduce soil loss follow these instructions:

Equipment and Material

Two boards 1-inch thick

Two watertight boxes (about 16 inches long, 12 inches wide and 4 inches deep). These boxes may be used for several demonstrations. Cut a "v" notch 1 1/2 inches deep at one end of the boxes and fit a tin spout in it.



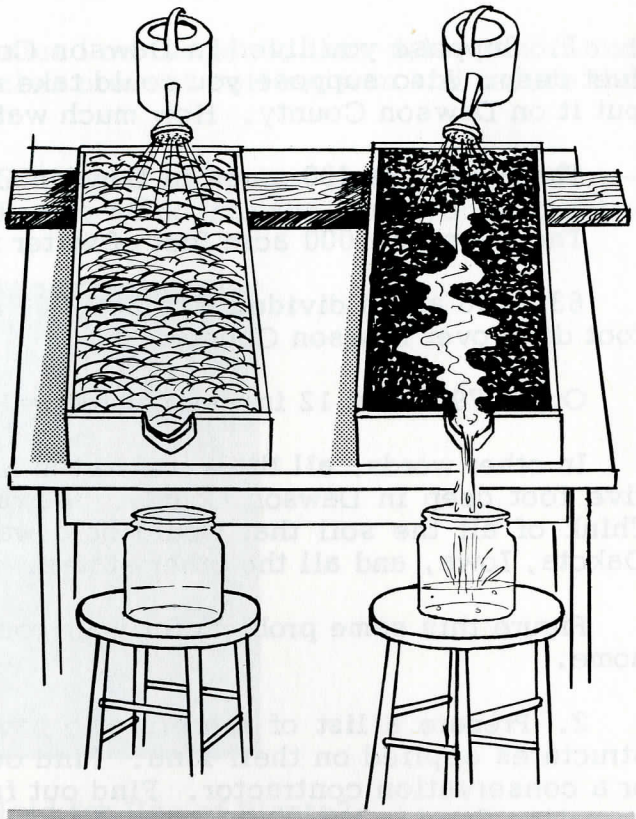
Two sprinklers one-quart or larger (flower sprinklers or jars with holes punched in their lids).

Two half-gallon fruit jars or pans of equal size.

Two samples of the same kind of soil to fit in the boxes.

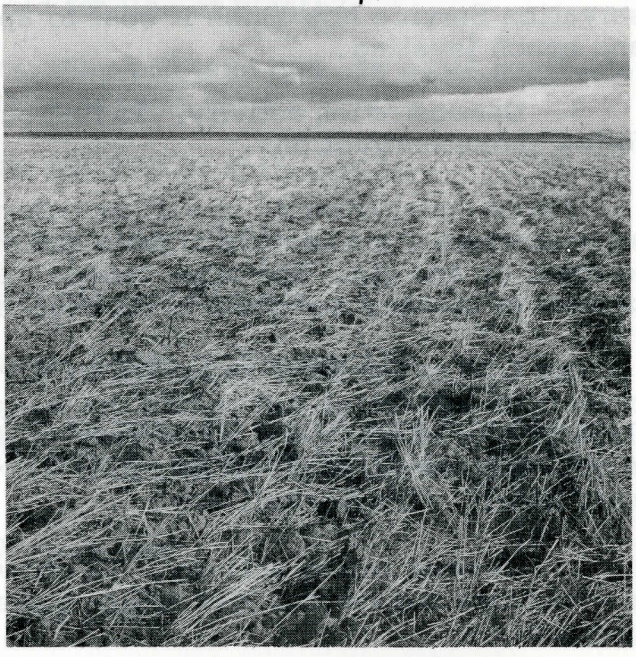
Procedure

Place sample of soil in each box. Cover one box of soil with a thin layer of straw, grass, cotton burs, or any other good mulch. Place a 1-inch thick board under each box opposite the end of the spout. Using sprinklers filled with water, pour steadily and at the same rate and height on the boxes of soil.



Results

Water sprinkled on the bare soil will run off rapidly carrying soil with it and the flow will last only a short time. Water sprinkled on the soil containing the mulch will take longer to begin flowing, will flow for a longer time and will carry less soil with it. Also, less water will run off this box.



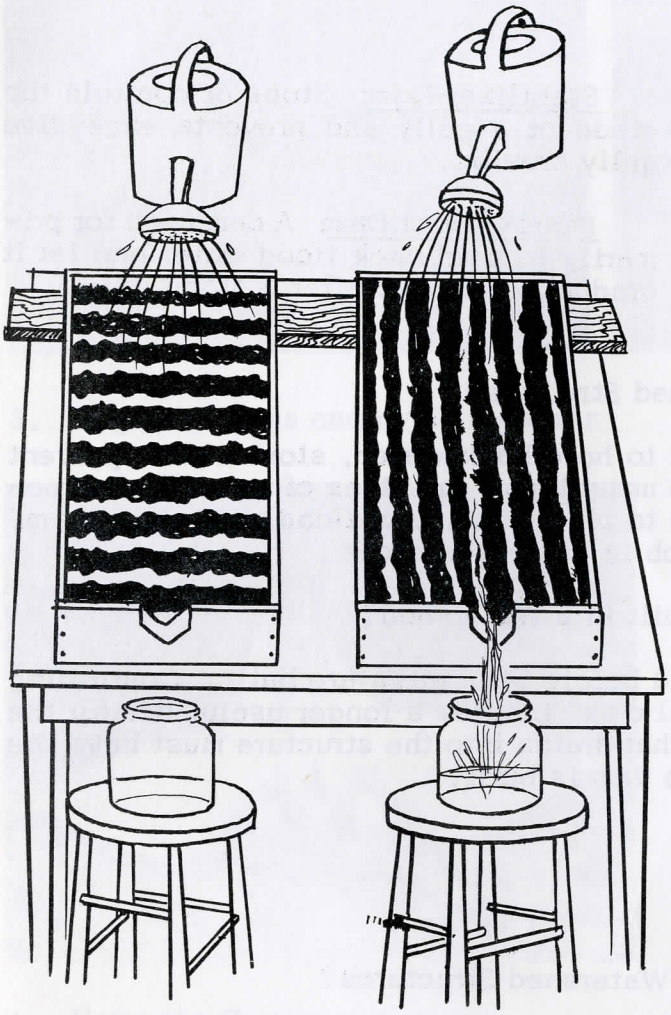
Conclusion

Mulches will reduce "runoff", slow the rate of water movement and, because of this reduced speed, will carry only a little soil with it.

5. Demonstration activity: To show that by contouring our land we can decrease soil and water runoff, follow these directions:

Equipment and Materials

Two boxes (about 16 inches long, 12 inches wide, and 4 inches deep). These boxes may be used for several demonstrations. Cut a "v" notch 1 to 1 1/2 inches deep at one end of the boxes and fit a tin spout in it.



Two soil samples

Two sprinklers

Two boards 1-inch thick

Two wide-mouth fruit jars (about 1/2 gallon)

Procedure

Make furrows across the soil in one box and down the soil in the other, using your finger or a pencil. Place one wide mouth fruit jar under each spout. Place the 1-inch board under each box opposite the spout. Using a sprinkler filled with water, pour steadily at the same rate and height on the boxes of soil.

Results

The water sprinkled over the box of soil with furrows running "up and downhill" will run down the furrows at a speed great enough to pick up soil and carry it out the spout and into the fruit jar. The water sprinkled over the box of soil with the contours running across the slope will be slowed down, held in the furrows and will be allowed more time to soak into the soil. This will result in the water flowing less rapidly; therefore, there will be less soil movement and less water runoff.

Conclusion

Running your rows up and down the slope gives water falling on the land a chance to pick up enough speed to remove considerable soil with it. Running your rows on the contour, that is, perpendicular to the slope, tends to reduce the speed of the water and reduces soil runoff. By reducing the speed of the water and keeping it on land longer, you get the added advantage of giving the water more time to soak into the land. This is why contour farming is recommended on sloping land as a conservation practice. Contour farming alone will not stop erosion; therefore, for best results, you should use it with combinations of other conservation practices.

MEETING NO. 7. RUNOFF CONTROL STRUCTURES

New Words to Look For

Grade: The amount of rise or fall in 100 feet of horizontal distance. (Figured the same as percent of slope)

Spillway: That part of a dam that allows excess water to flow around or through the dam.

Stabilizer Dam: Stops or controls the grade of a gully and prevents excessive gully erosion.

Flood Control Dam: A dam used for primarily to hold back flood water and let it gradually flow out after a storm.

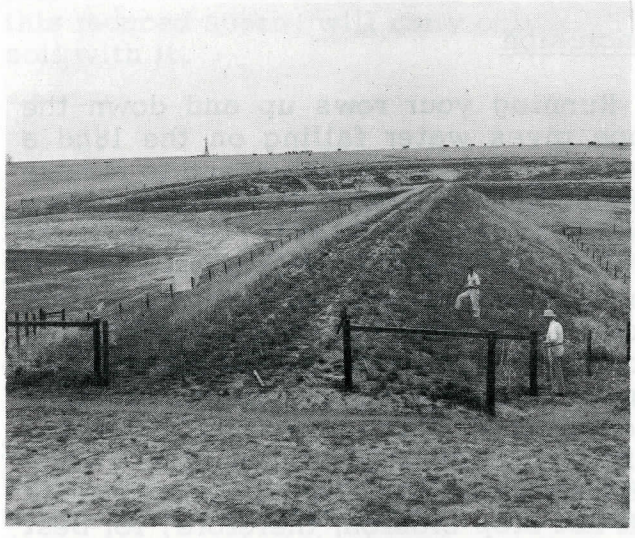
What are Watershed Structures?

Watershed structures are devices built to hold back water, store water, prevent floods, and prevent soil washing. There are many types and sizes of watershed structures. These are often considered the tools to plan a complete flood control program. Each one is built to do a certain kind of a job in the watershed.

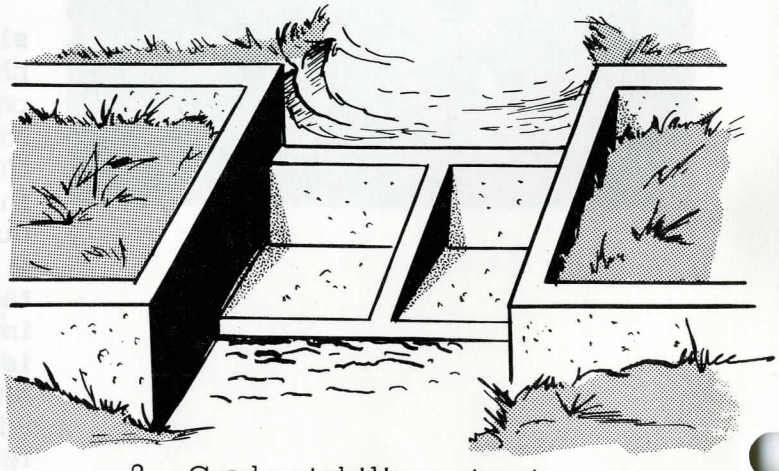
When are Structures Built in a Watershed?

Land treatment must be used on the land before structures are built. Controlling the silt that can accumulate in flood control dams insures a longer useful life for the dam. In Nebraska, 75 per cent of the land that drains into the structure must have the needed land treatment on the land before the dam is built.

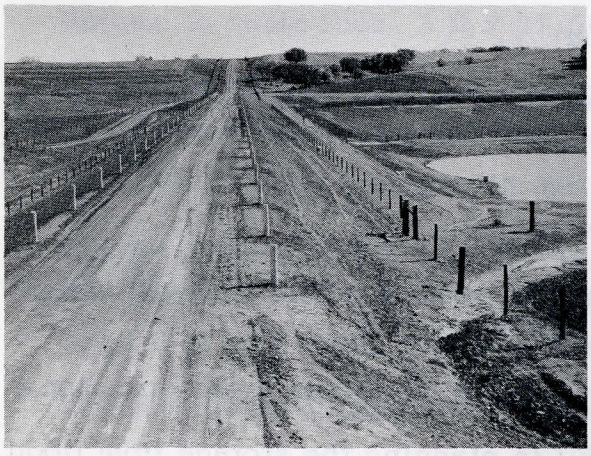
What are Some Common Watershed Structures?

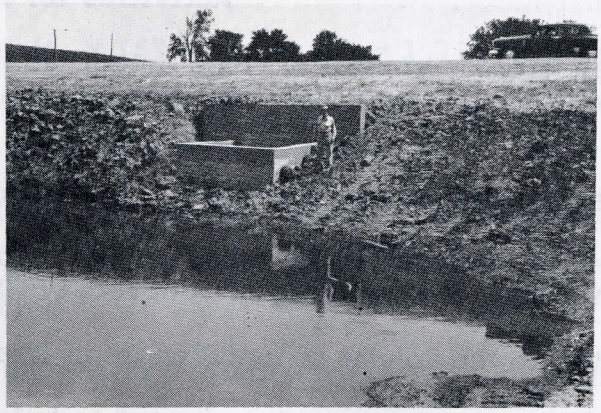


1. Flood control structure



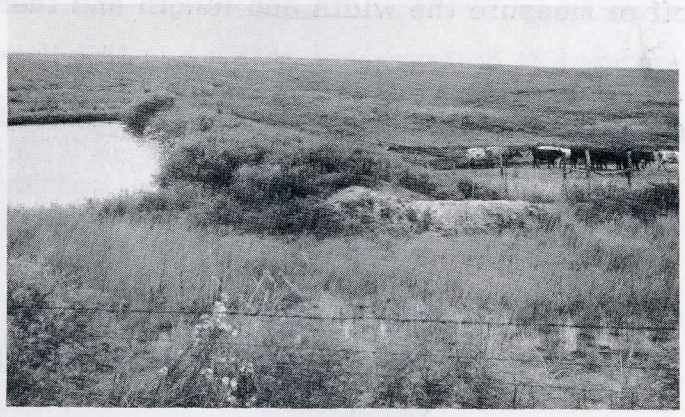
2. Grade stabilizer structure





3. Drop inlet dams and road structures

4. Concrete flumes and chutes



5. Farm erosion control and livestock water dams.

What Size Structures Control Floods in a Watershed?

Only a very small amount of flood water control can be obtained when several small dams are placed on the up-stream tributaries. Rains concentrated in the area below the small dams can still cause flooding.

Only partial flood control is obtained when a few large dams are used on down-stream main channels.

However, a combination of large and small flood control dams will do the best job of holding back flood amounts of run-off water.

Activities for You

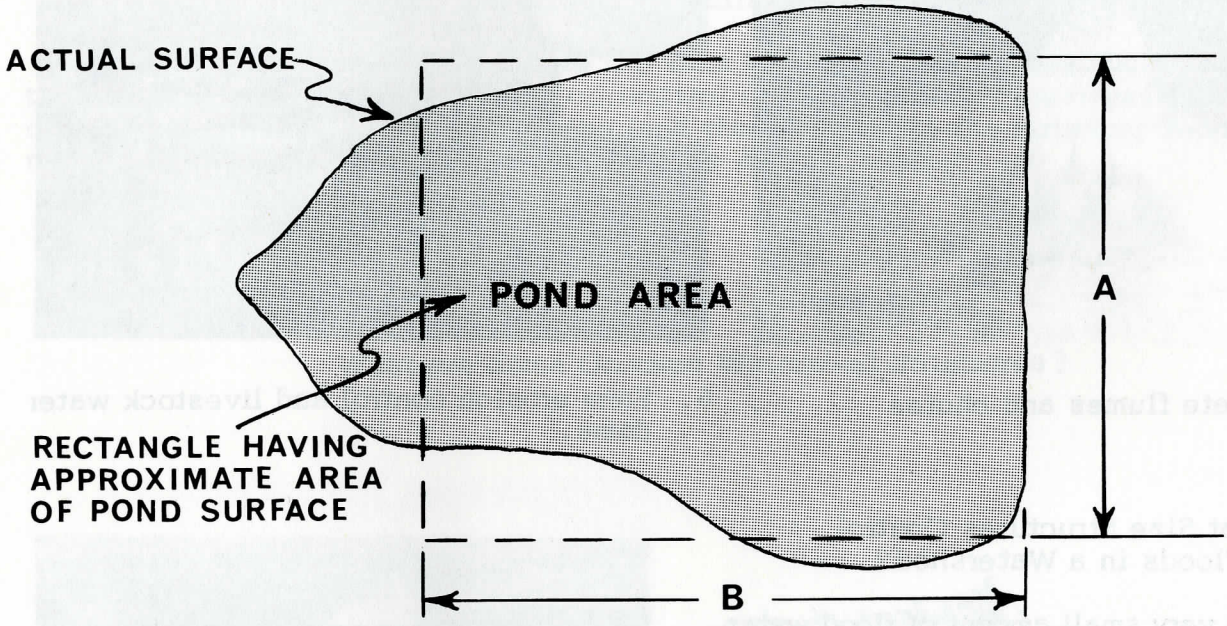
1. Visit erosion control or flood detention structures in your county. Make notes on the size of these structures, the drainage area above the structures, and the spillway size.

2. Measure the slope or grade of a waterway or field.

3. Make a model of a watershed structure that will solve a problem in your watershed. Get plans for structures at your local SCS office.

4. Estimate the volume of runoff water in a farm pond by following these directions:

The volume of a farm pond or dugout is helpful in planning the storage from flood runoff and for estimating the waste flow from irrigation. The volume in these storage reservoirs can be found by multiplying the surface area by the average depth. The average depth for most farm ponds is one-half the deepest point and for dugouts is three-fourths the deepest point. The surface area can be estimated by visualizing or estimating a rectangle having the same approximate area as the pond's surface. Step off or measure the width and length and then calculate the area of this rectangle.



Remember these quantities:

One acre = 43,560 square feet

An acre-foot of water is water standing one foot deep over an acre of land.

An acre-inch of water is water standing one inch deep over an acre of land.

For example, estimate the volume in gallons for a pond where the width is 150 ft. and the length is 210 ft. The maximum depth is 10 ft.

Surface area in square feet: 150 ft x 210 ft = 31,500 sq. ft.

Average depth: 10 ft/2 = 5 ft.

Volume in cubic feet: 5 ft x 31,500 sq. ft. = 157,500 cu. ft.

Volume in gallons: 7.5 gal. per cu. ft. x 157,500 cu. ft. = 1,181,250 gal. (1 cu. ft. = 7 1/2 gallons)

The volume may be wanted in units of acre-feet or acre-inches:

Surface area in acres: 31,500 sq. ft/43,560 sq. ft. per acre = 0.72 acres (1 acre = 43,560 sq. ft.)

Volume in acre-feet: 5 ft x 0.72 acres = 3.6 acre-feet

Volume in acre-inches: 12 inches per foot x 3.6 acre-feet = 43.2 acre inches

Following this example, estimate the volume of water in a farm pond you know about.

MEETING NO. 8. CAREERS WORKING WITH SOIL AND WATER

Have you considered a career in land and water resources development?

If you have enjoyed your project work with soil and water conservation and watersheds, you will no doubt be interested in knowing about some of the opportunities in this important field. Many people in full-time jobs devote their entire life working in some phase of soil or water conservation work. An even greater number spend time away from their regular jobs planning and promoting land development and water control. This project on "Watersheds" will have brought you into contact with some of the conservation-minded citizens in your county.

Who are the leading conservation-minded people in your community? Consider people you know and have met in these occupations:

Farmers and landowners

Government employees (State and Federal)

Local merchants

Conservation contractors

Soil and Water Conservation Districts Supervisors

Farm managers and appraisers

Watershed Organization Board Members

Irrigation and watershed district employees

Vocational Agriculture teachers and Extension agents.

What type training do each recommend?

If you are like most young people, you have been asked many times - what are you going to be when you grow up? Or, what would you like to do when you finish high school? Now is a good time to be thinking and planning for your career. Here is some food for thought!

In the future most conservation-related opportunities will require a college degree. Here are some college courses leading to employment in conservation related work. Perhaps you will want to select one of them.

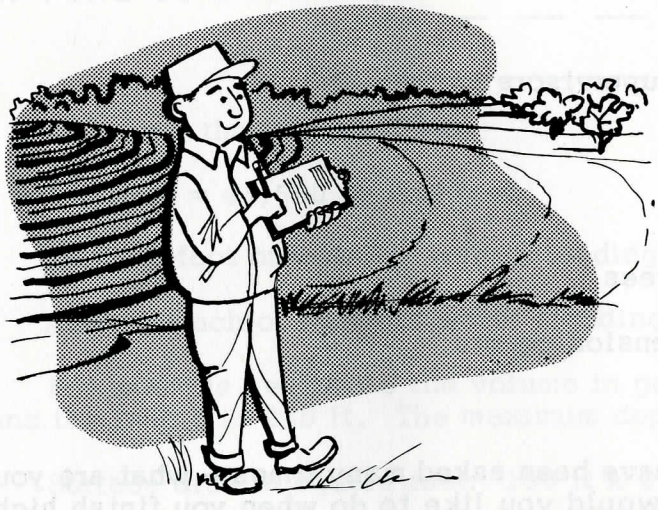
Agricultural Engineer and Other Engineering

Engineers design and supervise construction of the many structures used to prevent flooding, control erosion and provide water-control and water-supply, including earth-fill dams, spillways, drop structures, and erosion and waterway control structures. Agricultural lands present engineering design and construction problems in the areas of drainage, irrigation, terraces, water disposal systems. Streambank protection works, canals, pipelines, diversions, and well irrigation pumping systems offer engineers a wide area in which to specialize.

Hydrologists study any or all phases of the hydrologic cycle, including: storm rainfall and other types of precipitation; runoff, including monthly, seasonal, and annual yields and flood flows; and areas inundated by flood flows. They determine the effects of land use and treatment on flood flows and areas inundated.

A college degree in agricultural or civil engineering with major emphasis on hydraulics, hydrology, design, drainage, or irrigation will qualify you for exciting work in this broad field of specialties.

Soil Conservationist



A soil conservationist helps farmers and ranchers prepare a conservation plan that provides for the use and treatment of their land according to its needs and capability, a plan that is adapted to the type of operation the individual wishes to follow.

He gives onsite technical assistance where needed to apply the practices in the plans, such as terracing, strip cropping, contour farming, and establishing permanent vegetation.

A college degree with a major in soil conservation or a closely related agricultural science would qualify you for work in this field.

Farm and Irrigation Specialist (Mechanized Agriculture)

These specialists supervise and manage the operation and development of irrigated and specialized farm production units. Local watershed organizations and irrigation districts require employees with a general background in soil and water as managers and supervisors. A degree in Mechanized Agriculture with major emphasis on soil and water conservation and irrigation methods will qualify you for positions in this expanding field of work.

Soil Scientist

Soil scientists collect and record information about the soil. These records are kept in field notes and the information is placed on maps and overlays. The information is used by farmers, ranchers, and technical specialists in other fields.

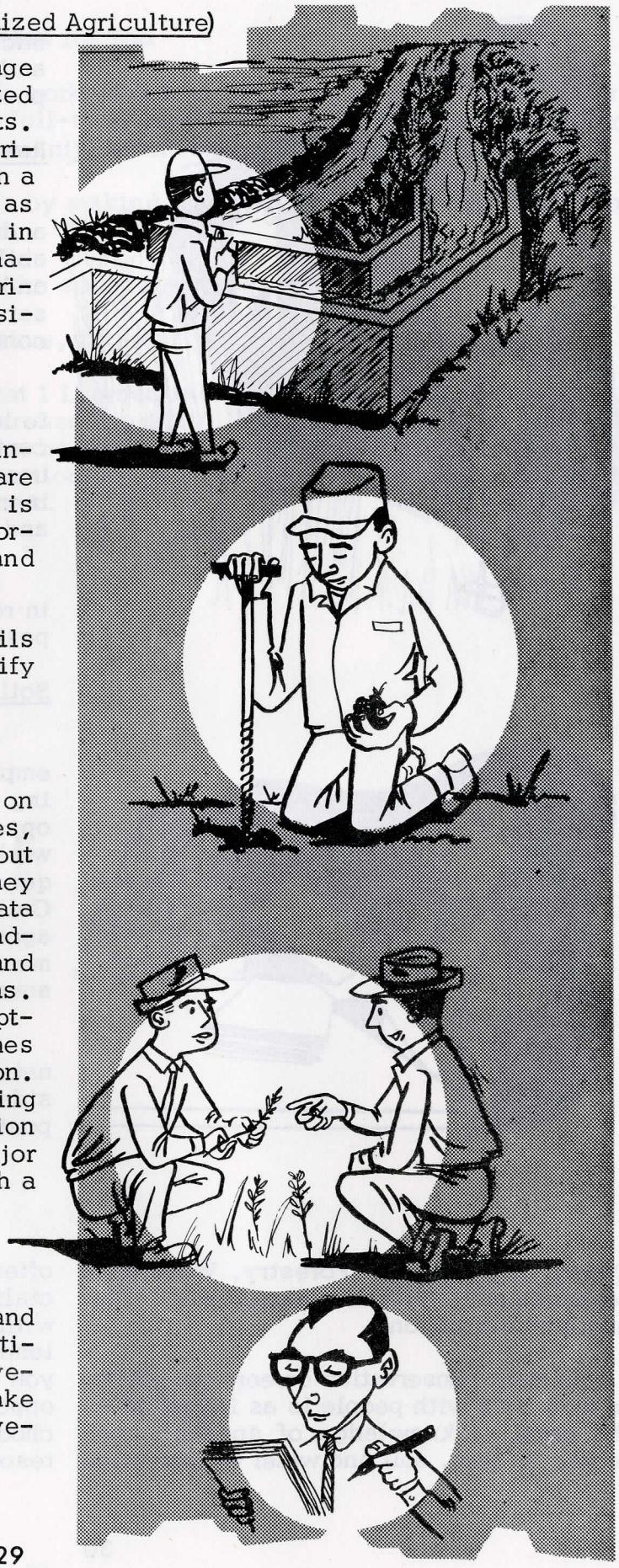
A college degree with a major in soils or a closely related subject would qualify you for work as a Soil Scientist.

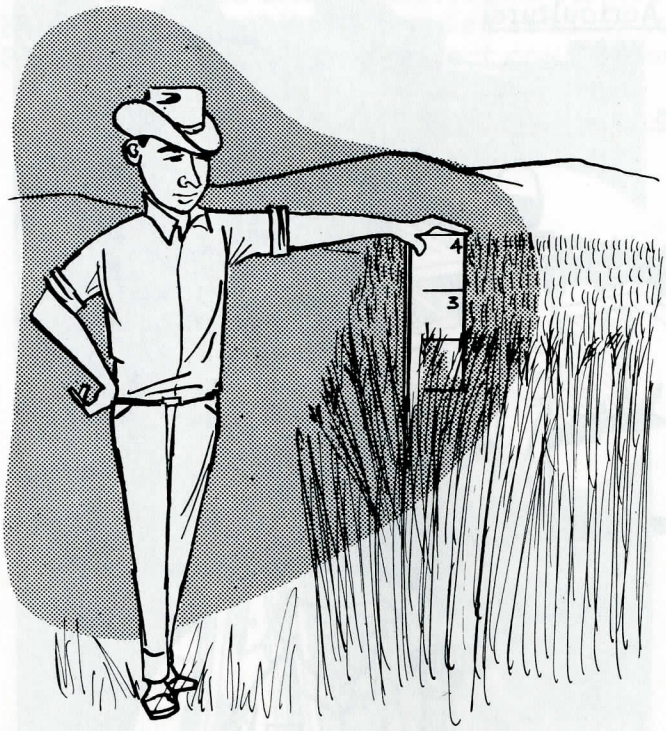
Agronomist

Agronomists give technical guidance on agronomic problems to SCS employees, farmers, and ranchers who are carrying out soil and water conservation programs. They interpret soil and crop experimental data for field use by service personnel, landowners, and operators who are planning and applying farm and ranch conservation plans. They conduct field trials to evaluate adaptability and handling of grasses and legumes useful in soil and water conservation. They determine methods of establishing grasses for soil and water conservation purposes. A college degree with a major in agronomy would qualify you for such a position.

Agricultural Economist

Agricultural economists collect and analyze cost and returns data. They estimate benefits that may come from improvement work, costs, and damages, and make benefit cost analysis of proposed improvements.





A college degree in agricultural economics with specified courses relating to land and water resources would qualify you for a position in Agricultural Economics.

Range Conservationist

Range conservationists help ranchers and livestock farmers to determine the suitability of their land for production of forage and other crops, and help to develop conservation practices needed to improve the condition of their ranges and pastures.

They give on-site technical assistance to landowners on reseeding, noxious plant control, water development, proper forage use, and systems of range management to increase forage production and to protect and improve the soil and water resources.

A college degree with specified courses in range management will qualify you for positions in range conservation.

Soil and Water Education and Research

Teachers and research specialists are employed in practically all fields involving soil and water. For these specialists, opportunities to train students for future work and to explore new ideas and techniques in research projects are challenging. Colleges, universities and government agencies provide opportunities for employment in many areas of soil and water resource education and research.

College graduates in any of the related natural resource fields may want to consider teaching and research in pursuit of a post-graduate degree.

Others to Consider: Forestry, Watershed Management, Wildlife Management, Law and Administration.

In many conservation careers the ability to work well with people is as important as the detailed knowledge of specific subjects. In fact, soil and water conservation offers a place for the highly technical specialist and the generalist who works more with the human resources associated with land and water. Regardless of the training you may receive, there are many rewarding opportunities awaiting you should you choose to work close to our greatest natural resourses - Soil and Water.

Activities for You

1. Interview at least two people who work with soil and water conservation in your community. One of them could have a full-time career in conservation and the other could be a person who works with a community effort only on a volunteer basis.

a. Prepare for these interviews by making an appointment with the people to be interviewed by telephone or by letter.

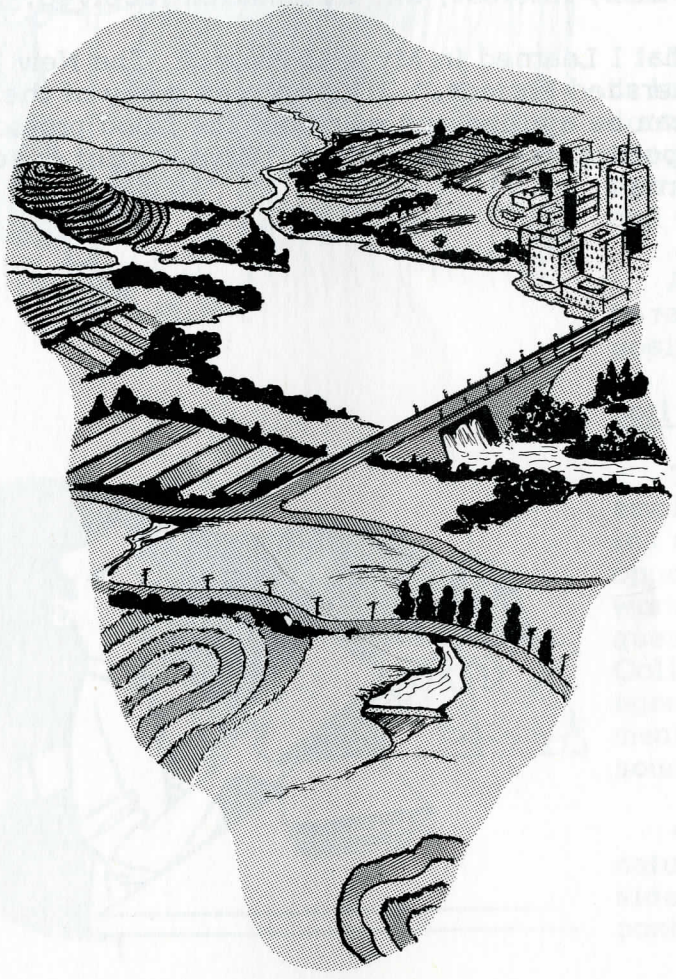
b. Appear for your interview at the scheduled time.

c. Thank the persons for their time, interest, and information received.

2. Write a short report telling "What I Learned in My 4-H Project: The New Look to Soil and Water Conservation, A Watershed Project." Illustrate as many of the soil and water conservation practices that can be applied and point out the flood protection benefits that result in the downstream portion of the watershed. Give a brief description of your watershed conservation corner.

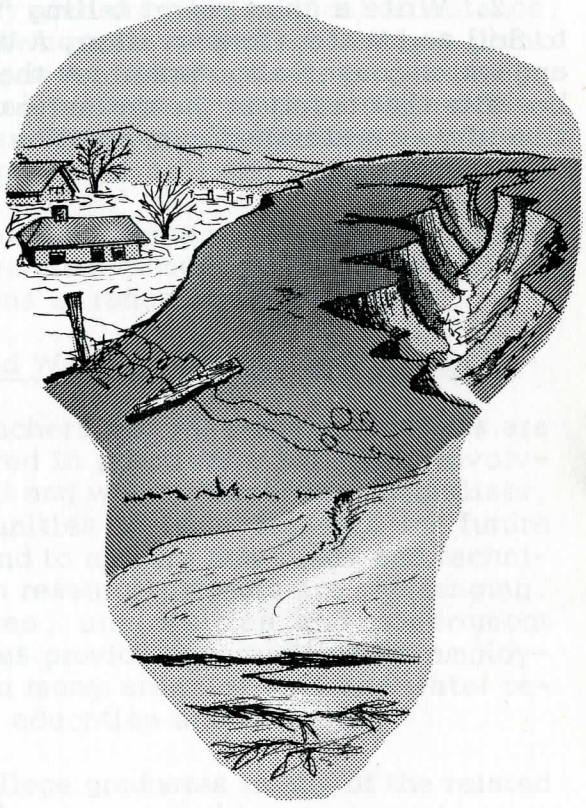
"Watersheds are a story of people--people working together in a community spirit to solve a common problem. It is a program based upon the best traditions of a democratic system of government. The initiative and leadership must come from local people. These are local projects assisted by federal and state governments."

WHO AM I?



WATERSHED, NEBRASKA

WHO AM I?



MUDVILLE, U.S.A.